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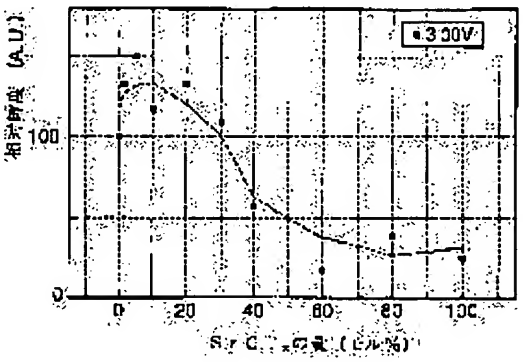
(54) SrTiO3:PR, Al FLUORESCENT SUBSTANCE FOR LOW-VOLTAGE DRIVE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an SrTiO3:Pr, Al fluorescent substance which is driver by a low voltage in particular alternative to conventional sulfide ones.

SOLUTION: This fluorescent substance consists of a composition shown by the formula: (MeIMeIIMeIII) TiO3.A2O3 which is obtained by adding MeIII to a fluorescent substance shown by the formula: (MeIMeIII) TiO3.A2O3 (wherein, MeI is one metallic atom selected from the group consisting of Mg, Ca, Sr and Ba; MeII is one metallic atom selected from the group consisting of Zn and Cd; MeIII is one metallic atom selected from the group consisting of Pr, Eu, Tb. Er, Ce and Tm; and A is one metallic atom selected from the group consisting of Al, Ga In and Tl). This fluorescent substance thus obtained can manifest sufficiently high luminance even in case a low voltage is applied thereto.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] It considers as the gap choose MeI from the group which consists of magnesium (Mg), calcium (calcium), strontium (Sr), and barium (Ba), or one sort of metals. It considers as the gap choose MeII from the group which consists of zinc (Zn) and cadmium (Cd), or one sort of metals. MeIII A praseodymium (Pr), europium (Eu), a terbium (Tb), It considers as the gap or one sort of metals which be chosen from the group which consists of an erbium (Er), a cerium (Ce), and a thulium (Tm). When considering as the gap choose A from the group which consists of aluminum (aluminum), a gallium (Ga), an indium (In), and a thallium (Tl), or one sort of metals, (MeIMeIII) SrTiO3 for low-battery actuation characterized by adding MeII to the fluorescent substance which consists of TiO3 and A2O3, and obtaining the constituent of TiO(MeIMeIIMeIII) 3 and A2O3 :P r, aluminum system fluorescent substance.
[Claim 2] It is SrTiO3 for low-battery actuation according to claim 1 which MeII is Zn and is characterized by A being aluminum in the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 :P r, aluminum system fluorescent substance.
[Claim 3] it sets to the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 -- object for low-battery actuation according to claim 1 which the addition of MeII is 0.01-15-mol %, and is characterized by the thing which was chosen from the group which consists of SrCl2, ZnCl2, CdCl2, SrI2, ZnI2, and CdI2 as flux, and which used any one sort of compounds at least SrTiO3 :P r and aluminum system fluorescent substance.
[Claim 4] SrTiO3 for low-battery actuation according to claim 3 to which concentration of said flux is characterized by 0.5-60-mol being % :P r, aluminum system fluorescent substance.
[Claim 5] It is SrTiO3 for low-battery actuation according to claim 1 characterized by the addition of MeIII being 0.05-5-mol % in the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 :P r, aluminum system fluorescent substance.
[Claim 6] It is SrTiO3 for low-battery actuation according to claim 1 characterized by the addition of A being 0.5-80-mol % in the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 :P r, aluminum system fluorescent substance.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is SrTiO3 for low-battery actuation which consists of an oxide system which the fluorescent substance for low-battery actuation is started, and can be especially transposed to a sulfide system fluorescent substance :P It is related with r and aluminum system fluorescent substance.
[0002]
[Description of the Prior Art] In order to make a field emission component (Field Emission Display:FED) drive in a low-battery field 1kV or less, to use the fluorescent substance which discovers luminous efficiency high also in such a low-battery field is desired. In FED to which it comes to apply the existing sulfide system fluorescent substance, it was inferior to the chemical stability at the time of actuation, and, moreover, there was a problem in respect of surface charge are recording (charge build-up). In order to solve these troubles, the research to an oxide system fluorescent substance is active.
[0003] However, as said oxide system fluorescent substance, only what is about 30 - 40% of the brightness in which said sulfide system fluorescent substance may emit light is obtained the old place. Since the sulfide system fluorescent substance applied to FED generally used on the other hand now discovers high luminous efficiency when driving in a high-tension field (5-10kV), it can emit light in high brightness easily, but when driving in a low-battery field (1kV or less), according to luminous efficiency being low, its brightness of luminescence is low and, moreover, it has a problem in respect of surface charge are recording. For this reason, a fluorescent substance with good luminous efficiency is needed also in said low-battery field, and the sulfide system fluorescent substance is called on for development of the efficient oxide system fluorescent substance in which a replacement is possible.
[0004] As one of such the oxide system fluorescent substances, it is SrTiO3 until now :P The fluorescent substance of r is developed. However, this oxide fluorescent substance has the problem that brightness is low, when driving in a low-battery field. Then, SrTiO3 whose brightness improved in the U.S. Pat. No. 5,619,098 number in order to solve this problem :P The fluorescent substance of r and aluminum systems is indicated. However, in applying this fluorescent substance to FED for low batteries (1kV or less), the improvement in the further brightness and chemical stability are desired.
[0005]
[Problem(s) to be Solved by the Invention] This invention is SrTiO3 for low-battery actuation with which accomplish in view of the above-mentioned situation, and the object of this invention has brightness equivalent to the conventional FED, and even the low battery of 1kV or less indicates high brightness to be :P It is in offering r and aluminum system fluorescent substance.
[0006]
[Means for Solving the Problem] In order to attain said object, as a result of this invention person's etc. inquiring wholeheartedly, the magnesium (Mg) of an alkaline earth metal, calcium (calcium), strontium (Sr), and any one sort of elements of the barium (Ba), Any one sort of elements of the praseodymium (Pr) of rare earth, europium (Eu), a terbium (Tb), an erbium (Er), a cerium (Ce), and the thuliums (Tm),

the -- an III group's aluminum (aluminum), a gallium (Ga), and an indium (In) -- A zinc group's zinc (Zn), and any one sort of elements of the cadmium (Cd) by using and adding flux to the fluorescent substance containing any one sort of elements of the thalliums (Tl) It finds out that it is possible to embody the fluorescent substance which discovers high brightness also by the low battery, and came to create this invention.

[0007] Namely, SrTiO3 for low-battery actuation concerning this invention :P r and aluminum system fluorescent substance It considers as the gap choose MeI from the group which consists of magnesium (Mg), calcium (calcium), strontium (Sr), and barium (Ba), or one sort of metals. It considers as the gap choose MeII from the group which consists of zinc (Zn) and cadmium (Cd), or one sort of metals. MeIII A praseodymium (Pr), europium (Eu), a terbium (Tb), It considers as the gap or one sort of metals which be chosen from the group which consists of an erbium (Er), a cerium (Ce), and a thulium (Tm). When considering as the gap choose A from the group which consists of aluminum (aluminum), a gallium (Ga), an indium (In), and a thallium (Tl), or one sort of metals, (MeIMeIII) It is characterized by adding MeII to the fluorescent substance which consists of TiO3 and A2O3, and obtaining the constituent of TiO(MeIMeIIMeIII) 3 and A2O3. (Claim 1)

[0008] in this invention, it sets to the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 preferably -- MeII is Zn and A is aluminum. (Claim 2)

moreover, it sets to the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 preferably -- the addition of MeII was chosen from the 0.01-15-mol group which is % and consists of SrCl2, ZnCl2, CdCl2, SrI2, ZnI2, and CdI2 as flux -- any one sort of compounds are used at least. (Claim 3)

At this time, the concentration of said flux is 0.5-60-mol % preferably. (Claim 4)

[0009] furthermore, in this invention, it sets to the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 preferably -- the addition of MeIII is 0.05-5-mol %. (Claim 5)

And in this invention, the addition of A is 0.5-80-mol % in the constituent of aforementioned (MeIMeIIMeIII) TiO3 and A2O3 preferably. (Claim 6)

[0010]

[Embodiment of the Invention] SrTiO3 for low-battery actuation which starts this invention hereafter based on the attached drawing :P r, aluminum system fluorescent substance, and its manufacture approach are explained to a detail. In addition, this invention can be suitably changed, as long as it is not limited only to the gestalt of this operation and is based on the technical thought of this invention.

SrTiO3 for low-battery actuation concerning this invention :P r and aluminum system fluorescent substance are the constituents of TiO3 and A2O3 which add MeII to the conventional fluorescent substance which consists of TiO(MeIMeIII) 3 and A2O3, and are obtained (MeIMeIIMeIII). MeI is the gap or one sort of metals which be chosen from the group which consists of Mg, calcium, Sr, and Ba here. MeII is the gap or one sort of metals which be chosen from the group which consists of Zn and Cd. MeIII is the gap or one sort of metals which be chosen from the group which consists of Pr, Eu, Tb, Er, Ce, and Tm, and A is the gap or one sort of metals which be chosen from the group which consists of aluminum, Ga, In, and Tl. At this time, the addition of MeIII and A is 0.05-5-mol % and 0.5-80-mol % respectively.

[0011] Especially preferably, in said constituent, MeII is Zn and A is aluminum. Moreover, preferably, in TiO(MeIMeIIMeIII) 3 and A2O3, MeII is 0.01-15-mol %, and uses the gap or one sort of compounds which be chosen from the group which consists of SrCl2, ZnCl2, CdCl2, SrI2, ZnI2, and CdI2 as flux. At this time, the concentration of flux is 0.5-60-mol % preferably.

[0012] SrTiO3 concerning this invention which can perform efficient luminescence also by such low battery :P In order to raise various kinds of solid-state physical properties, r and aluminum system fluorescent substance add a predetermined additive, structure is converted into desirable structure, or by the approach using predetermined flux, increase crystallinity and are formed. That is, it is SrTiO3, in order to convert the aforementioned structure into desirable structure and to raise said various kinds of solid-state physical properties :P In case r and aluminum system fluorescent substance are prepared, Zn (OH)2 and Cd (OH)2 are added as an additive containing Zn which is Zn group's element, and Cd. Furthermore, SrTiO3 :P In case r and aluminum system fluorescent substance are prepared, the flux

(fusing agent) of halogen systems, such as ZnCl2 and SrCl2, is used, by this, a baking reaction is made smooth, crystallinity is increased as the result, and said various kinds of solid-state physical properties are raised.

[0013]

[Example] ArTiO3 for low-battery actuation which starts this invention hereafter :P It explains concretely using the examples 1-5 of r and aluminum system fluorescent substance. In addition, this invention can be suitably changed, as long as it is not limited only to this example and based on the technical thought of this invention.

The fluorescent substance which adds % of 0.125-mol Pr3 +60-mol % of Ga 2O3, and 1-30-mol % of SrCl2 to <example 1> SrTiO3 matrix, and is applied to this invention was manufactured. Here, said SrCl2 is added as flux. Drawing 1 , drawing 2 , and drawing 3 are graphs which show respectively relative luminance when a respectively different electrical potential difference is impressed to the anode (anode; anode plate) of the fluorescent substance concerning this invention manufactured by doing in this way, and show change of the relative luminance discovered with each concentration (mol %) of SrCl2 added by the fluorescent substance concerning this invention. That is, drawing 1 is the graph which showed the relation between the concentration (mol %) of SrCl2 at the time of impressing the electrical potential difference of 300V, and relative luminance, drawing 2 is the graph which showed the relation between the concentration (mol %) of SrCl2 at the time of impressing the electrical potential difference of 500V, and relative luminance, and drawing 3 is the graph which showed the relation between the concentration (mol %) of SrCl2 at the time of impressing the electrical potential difference of 1000V, and relative luminance. Even when a comparatively low electrical potential difference called 300V is impressed so that clearly from drawing 1 , it turns out that high brightness equivalent to the case where a comparatively high electrical potential difference called 500V and 1000V is impressed is obtained.

[0014] The fluorescent substance which adds % of 0.125-mol Pr3 +60-mol % of Ga 2O3, and 1-60-mol % of ZnCl2 to <example 2> SrTiO3 matrix, and is applied to this invention was manufactured. Here, said ZnCl2 is added as flux. the anode (anode; anode plate) of the fluorescent substance concerning this invention manufactured by carrying out drawing 4 , drawing 5 , and drawing 6 in this way -- difference -- it is the graph which shows respectively relative luminance when an electrical potential difference is impressed, and change of the relative luminance discovered with each concentration (mol %) of ZnCl2 added by the fluorescent substance concerning this invention is shown. That is, drawing 4 is a graph which shows the relation between the concentration (mol %) of ZnCl2 at the time of impressing the electrical potential difference of 300V, and relative luminance, drawing 5 is a graph which shows the relation between the concentration (mol %) of ZnCl2 at the time of impressing the electrical potential difference of 500V, and relative luminance, and drawing 6 is a graph which shows the relation between the concentration (mol %) of ZnCl2 at the time of impressing the electrical potential difference of 1000V, and relative luminance. Even when a comparatively low electrical potential difference called 300V is impressed so that clearly from drawing 4 , it turns out that high brightness equivalent to the case where a comparatively high electrical potential difference called 500V and 1000V is impressed is obtained.

[0015] < -- an example -- three -- > -- SrTiO -- three -- a matrix -- 0.125 -- a mol -- % -- Pr -- three -- + -- 20 -- a mol -- % -- aluminum -- (-- OH --) -- three -- one - ten -- a mol -- % -- Zn -- (-- OH --) -- two -- adding -- this invention -- starting -- a fluorescent substance -- having manufactured . Here, said Zn (OH)2 was used as an additive of Zn group system. the anode (anode; anode plate) of the fluorescent substance concerning this invention manufactured by carrying out drawing 7 , drawing 8 , and drawing 9 in this way -- difference -- it is the graph which shows respectively relative luminance when an electrical potential difference is impressed, and change of the relative luminance discovered with each concentration (mol %) of Zn (OH)2 added by the fluorescent substance concerning this invention is shown. Namely, drawing 7 is a graph which shows the relation between the concentration (mol %) of Zn (OH)2 at the time of impressing the electrical potential difference of 300V, and relative luminance. drawing 8 -- 500 -- V -- an electrical potential difference -- having impressed -- a case -- Zn -- (-- OH --)

-- two -- concentration (mol %) -- relative luminance -- relation -- being shown -- a graph -- it is -- drawing 9 -- 1000 -- V -- an electrical potential difference -- having impressed -- a case -- Zn -- (-- OH --) -- two -- concentration (mol %) -- relative luminance -- relation -- being shown -- a graph -- it is . Even when a comparatively low electrical potential difference called 300V is impressed so that clearly from drawing 7 , it turns out that high brightness equivalent to the case where a comparatively high electrical potential difference called 500V and 1000V is impressed is obtained.

[0016] In order to compare the difference in the brightness discovered by the flux which is used by <example 4> this invention, and which is different from each other, the fluorescent substance which adds ZrCl2 or SrCl2 to SrTiO3 matrix as flux, and is applied to it at this invention in 0.3-mol % Pr3+, and 60-mol % of Ga 2O3 was manufactured. [1-20 mol %] Drawing 10 is a graph which shows relative luminance when the same predetermined electrical potential difference is impressed to the anode (anode; anode plate) of the fluorescent substance concerning this invention manufactured by doing in this way, and is a graph which shows the relative luminance by each concentration (mol %) of the flux added by the fluorescent substance concerning this invention. In drawing 10 , an axis of abscissa shows the concentration (mol %) of flux, and the axis of ordinate shows relative luminance. Moreover, the graph displayed by "** (black-lacquered rectangular head)" is a graph which shows the relation of the flux concentration about a fluorescent substance and relative luminance concerning this invention which added ZnCl2 as flux, and the graph displayed by "O (round head of void)" is a graph which shows the relation of the flux concentration about a fluorescent substance and relative luminance concerning this invention which added SrCl2 as flux. It turns out that each fluorescent substance concerning this invention which each of ZrCl2 and SrCl2 is added and becomes is changing almost similarly [the relation between flux concentration and relative luminance], flux concentration also increased relative luminance as flux concentration increased to about 10 mol %, and relative luminance is mostly saturated with 10% or more by flux concentration so that clearly from drawing 10 .

[0017] The fluorescent substance which adds SrCl2 with a Zn(OH) 2 or 4-mol % of 0.3-mol Pr[% of] 3 +17-mol aluminum[% of] (OH) 3 or 10-mol % to <example 5> SrTiO3 matrix, and is applied to it at this invention was manufactured. Drawing 11 is a graph which shows relative luminance when the electrical potential difference of 300V is impressed to the anode (anode; anode plate) of the fluorescent substance concerning this invention manufactured by doing in this way. Here, the axis of abscissa shows relative luminance. It turns out that the fluorescent substance concerning this invention which SrCl2 is added as flux and becomes shows high brightness relatively compared with the fluorescent substance with which this SrCl2 is not added so that clearly from drawing 11 .

[0018]

[Effect of the Invention] According to this invention constituted, brightness improves substantially, without changing a color coordinate (x= 0.67, y= 0.33) as explained above. Moreover, SrTiO3 for low-battery actuation which crystallinity improves, and stability increases and can be applied to the display device containing CL device (Cathod Luminescence) of a low battery as the result :P It becomes possible to offer r and aluminum system fluorescent substance.

[Translation done.]